

2/6/18

"Champions keep playing until they get it right."-Billie Jean KingHW: "Solving Higher Degree Polynomials" #8, 12, 18
Test 1 on Thursday 2/15

AIM: How do we solve higher degree polynomials?

Warm Up:

1) Solve by completing the square : $\frac{3x^2}{3} + \frac{1}{3} = \frac{2x}{3}$

half/square/share

$$x^2 + \frac{1}{3} = \frac{2}{3}x$$

$$-\frac{1}{3} \quad -\frac{2}{3}x$$

$$\frac{-\frac{2}{3}}{2} = -\frac{1}{3}$$

$$\left(-\frac{1}{3}\right)^2 = \frac{1}{9}$$

$$x^2 - \frac{2}{3}x + \boxed{\frac{1}{9}} = -\frac{1}{3} + \boxed{\frac{1}{9}}$$

$$\pm \sqrt{\left(x - \frac{1}{3}\right)^2} = \pm \sqrt{-\frac{2}{9}}$$

$$x - \frac{1}{3} = \pm \sqrt{-\frac{2}{9}}$$

$$x - \frac{1}{3} = \pm \frac{i\sqrt{2}}{3}$$

$$+\frac{1}{3} \quad +\frac{1}{3}$$

$$x = \frac{1}{3} \pm \frac{i\sqrt{2}}{3}$$

Exercises:

On a **SEPARATE SHEET OF PAPER**, find:

- (a) the complete factorization of $p(x)$.
 (b) The complete solution set for $p(x)$.

1. $p(x) = x^4 - 13x^2 + 36$

a) $(x^2 - 9)(x^2 - 4)$
 $(x-3)(x+3)(x+2)(x-2)$

b) $x = 3, -3, -2, 2$

Set each of
the factors = 0
and solve

3. $p(x) = (x^2 + 5x - 7)(x + 2)$

a) $(x^2 + 5x - 7)(x + 2)$

b) $x^2 + 5x - 7 = 0$ $x + 2 = 0$
 $x = -2$

$x = \frac{-5 \pm \sqrt{5^2 - 4(1)(-7)}}{2(1)}$

$x = \frac{-5 \pm \sqrt{53}}{2}$

$x = -2, \frac{-5 \pm \sqrt{53}}{2}$

5. $p(x) = x^5 - 12x^3 + 32x$

$x(x^4 - 12x^2 + 32)$

$x(x^2 - 8)(x^2 - 4)$

a) $x(x^2 - 8)(x - 2)(x + 2)$
 $x = 0$ $x^2 - 8 = 0$ $x = 2$ $x = -2$
 $x^2 = 8$
 $x = \pm\sqrt{8}$

b) $x = 0, \pm\sqrt{8}, 2, -2$

9. $p(x) = (x^2 + 9)(x + 3)$

a) $(x^2 + 9)(x + 3)$

$x^2 + 9 = 0$

$x^2 = -9$

b) $x = \pm\sqrt{-9}$ $x = -3$

$x = \pm 3i$

HW ✓

$$8) P(x) = x^5 - 10x^3 + 9x$$

$$a) x(x^4 - 10x^2 + 9)$$

$$x(x^2 - 9)(x^2 - 1)$$

$$a) x(x+3)(x-3)(x+1)(x-1)$$

$x+3=0$

$$b) x=0, -3, 3, -1, 1$$

$$12) P(x) = (x^2 - 1)(3x^2 + 2x + 1)$$

$$a) (x+1)(x-1)(3x^2 + 2x + 1)$$

3
Not factorable

$$b) x = -1, 1, \frac{-2 \pm \sqrt{-8}}{6}$$

$$x = \frac{-2 \pm \sqrt{2^2 - 4(3)(1)}}{2(3)}$$

$$x = \frac{-2 \pm \sqrt{-8}}{6}$$

* 2 is a root
what is the factor?
(x-2)

$$18) P(x) = x^3 - 3x^2 + 7x - 10$$

$$\begin{array}{r|rrrr} 2 & 1 & -3 & 7 & -10 \\ & & 2 & -2 & 10 \\ \hline & 1 & -1 & 5 & 0 \end{array}$$

$$x^2 - x + 5$$

$$P(x) = (x-2)(x^2 - x + 5) \quad a)$$

$$b) \begin{array}{ll} x-2=0 & x^2 - x + 5=0 \\ x=2 & x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(5)}}{2(1)} \end{array}$$

$$\boxed{2, \frac{1 \pm \sqrt{-19}}{2}} \quad x = \frac{1 \pm \sqrt{-19}}{2}$$

HW #13, 15, 17

$$13) P(x) = x^5 - x^4 - 2x^3$$

$$x^3(x^2 - x - 2)$$

$$a) x^3(x-2)(x+1)$$

$$b) 0, 2, -1$$

$$x^3 = x \cdot x \cdot x$$

$x=0 \quad x=0 \quad x=0$

$$15) P(x) = 16x^4 - 1$$

$$= (\underline{4x^2 - 1})(4x^2 + 1)$$

$$a) (2x + 1)(2x - 1)(4x^2 + 1)$$

15. $p(x) = 16x^4 - 1$

17. $p(x) = x^3 + 6x^2 + 11x + 6$ (hint: -1 is one of the roots)

19. $p(x) = x^3 - x^2 - 8x + 12$ (hint: -3 is one of the roots)

